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INFORMATION CIRCULAR

DESTRUCTION OF DAMAGED, DETERIORATED, OR UNWANTED COMMERCIAL EXPLOSIVES

BY

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DESTRUCTION OF DAMAGED, DETERIORATED, OR UNWANTED COMMERCIAL EXPLOSIVES[1]

By R. D. Leitch[2] and P. R. Moyer[3]

INTRODUCTION

From time to time the Bureau of Mines has received requests from persons who wish to destroy unwanted explosives, and although the information that follows has been accumulated from sources considered reliable,[4] the Bureau of Mines assumes no responsibility for accidents that may result from following the suggestions offered.

Explosives to be destroyed may be fresh material from damaged packages, usable material for which there is no further need, or material that has deteriorated either from natural aging or from improper storage to the point where it is unfit for use.

Deteriorated explosives may be, and often are, more dangerous to handle than explosives in good condition, but when there is any question about the safety of the undertaking, a representative of the manufacturer of the particular lot of explosives should be consulted or a request for assistance made to an authorized representative of the Bureau of Mines, or to some one else known to have had the necessary experience. This is especially true if large quantities of explosives must be destroyed.

GENERAL SAFE PRACTICES

Most explosives, except detonators, are best destroyed by burning.

The hazard of an explosion is always present, even under the most favorable conditions, so it is of prime importance to select a site where no damage will be done, either to persons or property, if the explosives detonate. This means a safe distance from any structure, railroad, or highway and from any place where one or more persons may be even accidentally exposed to danger, including that from flying missiles.

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7335."

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[4] (a) Institute of Makers of Explosives, 103 Park Ave., New York, N. Y.
(b) Blaster's Handbook, E. I. duPont de Nemours & Co., Wilmington, Del.
(c) Numerous standard text books and personal experience.

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During the destruction of any type of explosives the possibility of preignition should be prevented by eliminating smoking and open lights.

Only one type of explosives should be destroyed at a time, and the utmost care should be taken to see that no detonators are accidentally included in explosives to be destroyed by burning.

High explosives should never be burned in cases or in deep piles. Dynamites, especially permissible gelatins, become increasingly sensitive when overheated before ignition. Quantities of dynamite to be burned should not exceed 100 pounds of regular dynamite or 10 pounds of permissible gelatin. Local conditions may limit destruction to much smaller amounts, but when more than these maximum quantities must be destroyed, a new space should be selected for each lot, as it is not safe to place explosives on ground heated by the preceding burning.

No attempt should be made to return to the site so long as any flame or smoke can be observed.

As soon as all dynamite has been burned, it is believed to be good practice to plow the ground, as the residue remaining may contain salts said to be attractive to livestock, which if eaten may produce serious results.

DETAILED METHODS FOR DESTRUCTION

1. DYNAMITE

When properly stored, dynamite should remain in good condition for a long time, and often does so remain for years; but it may, and usually does deteriorate rapidly if improperly stored or handled. The most common signs of deterioration are discoloration, leakiness, hardness or excessive softness, or the formation of crystals on the outside of the wrapper. Frequently a combination of two or more of these signs can be noted.

Many persons believe that the crystals above mentioned are nitroglycerin and that they are especially dangerous; while these are not facts, because the crystals actually are salts that have exuded through the wrapper whereas nitroglycerin is an oily liquid at normal temperatures, the presence of crystals outside the wrapper or on the container shows that the dynamite has deteriorated to some degree.

Care should be exercised in handling deteriorated explosives, whether loose or in containers.

Most persons experience undesirable effects, especially headaches of varying degrees of severity, by absorption of nitroglycerin through the skin when handling leaky or loose dynamite, and some persons are so sensitive as to have headaches after working over loose dynamite for only a short time, even without touching it. Therefore, if leaky or loose dynamite

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must be handled, gloves should be worn and then destroyed by burning as often as they become impregnated with nitroglycerin during handling of the explosives.

Some dynamites are rather difficult to ignite, especially when wet, so it is best to prepare a bed of dry, combustible material, such as excelsior, wood shavings, or sawdust; to maintain combustion it is sometimes necessary before igniting the pile or bed to pour a little kerosine over the dynamite and the fuel bed. The area of this bed should be such that the dynamite to be destroyed may lie on it in a single layer if sticks or part sticks are being destroyed and not to exceed 2 inches in thickness if loose dynamite is to be burned. The bed should be long and narrow rather than square or circular.

It is often recommended to slit each stick of dynamite and scatter the loose material on the fuel bed; but considering the extra hazard to the operator in handling deteriorated dynamite, it seems preferable to deposit whole sticks of the more common sizes on the fuel bed as carefully as possible without slitting. If the cartridges are of large diameter, such as those often used in quarry blasting, the loose material should be spread; "free running" (loose) dynamite may be so spread, but never in thickness exceeding 2 inches.

When the bed has been formed and the dynamite deposited on it, a train of paper or similar readily ignitible material should be laid to it, preferably on the down-wind side, and the explosives ignited thus. The train should be long enough to permit the operator to reach a safe place.

Dynamite should ordinarily burn quietly, with a bluish flame. If solid pieces are observed to have remained, as sometimes happens, expecially if the dynamite was wet, it is dangerous to poke about the debris or attempt to handle these pieces for reburning until it is certain that they are cool.

The containers should be burned separately.

2. BLACK POWDER

This is best-destroyed by dumping into water, preferably in a stream or a large body of water, but some States have anti-stream-pollution laws that may be violated in this manner, so it is well to be informed on that question and to be certain that no damage will be done to water supplies in any event.

If it is inconvenient or inadvisable to destroy black powder thus, it may be burned. If that is done, the contents of only one container holding 25 pounds or less should be burned at a time. The powder should be poured on the ground in a trail not wider than about 2 inches, and no part of such a trail should parallel another part at a distance of less that 10 feet. A greater space should be provided if the trail is wider than suggested. A train of combustible material should be laid to the explosive for igniting it, as with dynamite.

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"Pellet powder" (black powder in compressed stick form) may be destroyed either by throwing in water after removing the wrapper, or as described for dynamite. If dry and in good condition, black powder burns rapidly, especially in small grain size, with a yellow or pinkish-blue flame and dense smoke.

The empty powder containers should be washed out, as explosives are said to have occurred with "empty" containers.

3. SMOKELESS POWDER

Smokeless powder is best-destroyed by burning - when in small-grain (sporting) size, as described for burning black powder of similar size, and when in large-grain (military) size, as described for dynamite. Smokeless powder should never be thrown in water to destroy it, because it is not completely soluble.

4. DETONATORS

Blasting caps, electric blasting caps, and delay electric blasting caps that have so deteriorated from age or improper storage that they are unfit for use should be destroyed. These devices should also be destroyed if they have ever been under water, as, for example during a flood, regardless of whether or not they have been subsequently dried out. In some cases, the shells of caps that have been wet and then dried will show signs of corrosion. Such caps may be very dangerous to handle, and it is recommended that they not be disturbed until a representative of the manufacturer has had an opportunity to pass on them. The method most generally used for destroying detonators is to explode them under some confinement as described below. Detonators should not be thrown into small bodies of water such as rivers, creeks, ponds, or wells.

If possible, it is advisable to explode ordinary (fuse) blasting caps in the original container with the cover removed. Otherwise, they should be prepared for blasting as follows: They should be placed in a small box or bag; a hole should be dug in the ground, preferably in dry sand, at least 1 foot deep; the container should be placed in the bottom of the hole and primed with one cartridge of dynamite and a good electric blasting cap or ordinary cap and fuse; and the caps and the primed cartridge should be carefully covered with paper and then with dry sand or fine dirt and fired from a safe distance. It is recommended that not more than 100 caps be destroyed at one time and that the ground around the shots be thoroughly examined after the shot to make certain that no unexploded caps remain. The same hole should not be used for successive shots.

To destroy electric blasting caps or delay electric blasting caps, it is necessary first to cut the wires off about 1 inch from the top of the cap, preferably with a pair of tin snips. No attempt should be made to cut the wires from more than one cap at a time. Not more than 100 caps should be placed in a box or paper bag, primed with a cartridge of dynamite and a good electric blasting cap, buried under paper and sand or dirt, and exploded as described above. The same precautions mentioned in the preceding paragraph should be observed.

Blasting caps should never be destroyed by placing them in a hole which is to be shot, especially by dropping them into well drill holes. Many bad accidents have occurred in this way.

5. ELECTRIC SQUIBS AND DELAY ELECTRIC SQUIBS

These devices should be destroyed by the same procedure as that used for electric blasting caps.

6. SAFETY FUSE

This material may be disposed of very satisfactorily by burning in a bonfire.

7. PRIMACORD

The preferred method of destroying Primacord is by burning. It should not be burned on the spool but should be strung out in parallel lines 1/2 inch or more apart on paper or dry straw.

8. OTHER MATERIALS, INCLUDING NITROGLYCERIN

The destruction of explosives and blasting supplies not included above should be referred to the manufacturer.

REMOVAL OF NITROGLYCERIN FROM MAGAZINE FLOORS

If floors of magazines become stained with nitroglycerin, they should be scrubbed well with a stiff broom, hard brush or mop, using an ample volume of a solution in the proportion of 1-1/2 quarts of water, 3-1/2 quarts of denatured alcohol, 1 quart of acetone, and 1 pound of sodium sulfide (60 percent commercial). The liquid should be used freely to decompose the nitroglycerin thoroughly. If the magazine floor is covered with rubberoid or any material impervious to nitroglycerin, this portion of the floor should be swept thoroughly with dry sawdust and the sweepings taken to a safe distance from the magazine and destroyed by burning.

It was formerly considered good practice to cover explosives-magazine floors with rubber or similar material, but the best practice now is generally believed to be a tight, smooth wood floor free from exposed nails or other metal fastenings, so as to eliminate holes and ragged edges that sooner or later resulted from excessive wear in spots on the floor covering. Floor coverings often hide the evidence of floor stains and, when worn, render proper cleaning difficult or impossible unless the whole floor covering is removed. With the tight wood floor now considered best, cleaning is more certain; and, if necessary, parts of the floor can be removed carefully and replaced.

CONCLUSION

Manufacturers frequently employ means of destroying explosives and blasting supplies other than by the methods described above, but such other methods should be employed only under the direction of the manufacturer's representative.

As indicated in the introduction to this circular, the information given is not for the purpose of encouraging persons unfamiliar with the proper methods of destroying explosives to undertake such work unassisted. But it is realized that expert advice and assistance are not always available. In such instances it is believed that destruction of unwanted explosives can be accomplished with less hazard by following the foregoing suggestions than is possible without this advice.